Toxicological Assessment of ISS Air Quality: December 2011 to May 2012

The toxicological assessment of 17 GSCs returned aboard Soyuz 28 and 29 from the ISS is shown in Table 1. The average recoveries of the 3 surrogate standards from the GSCs were as follows: ^{13}C-acetone, 110%; fluorobenzene, 107%; and chlorobenzene, 99%. Recoveries from formaldehyde badges, which were returned on 29S, averaged 101%.

Table 1. Analytical Summary of ISS Results

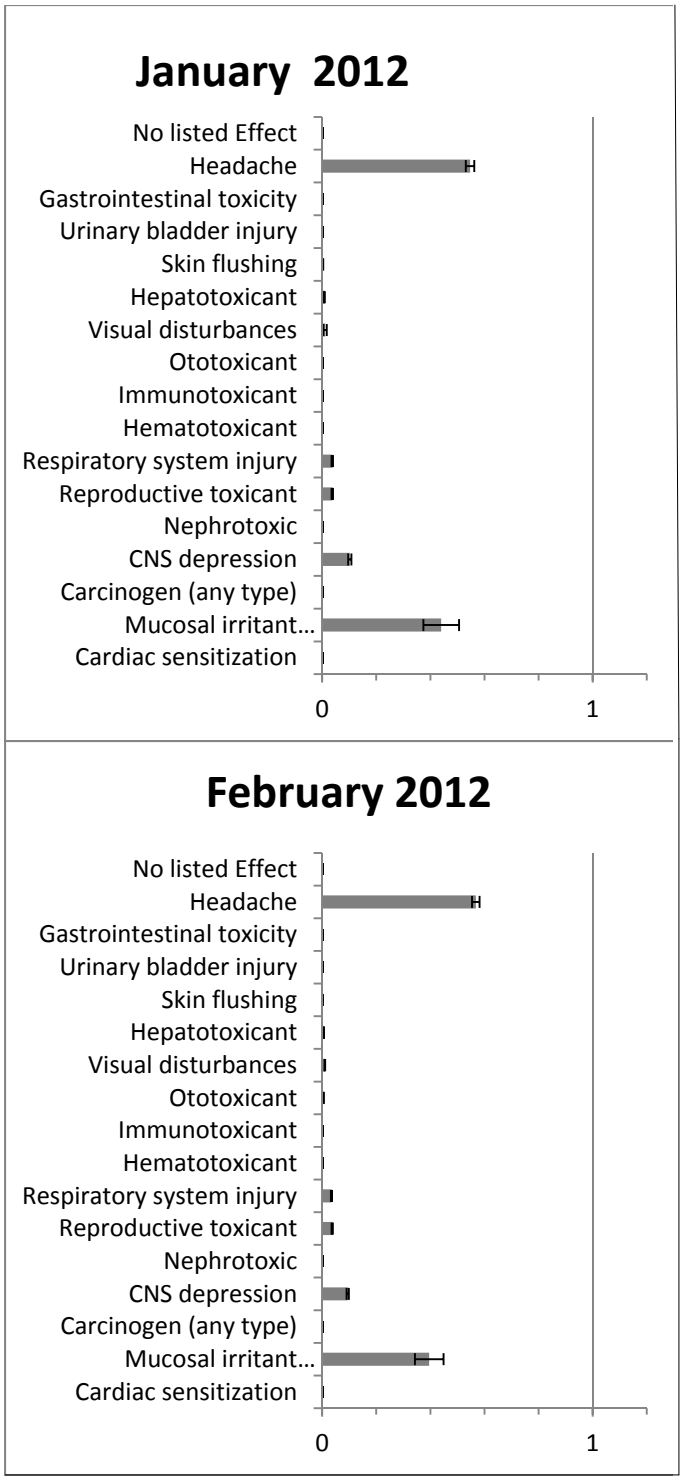
Module/Sample	Date of Sample	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	T Value[b] (units)	Alcohols (mg/m^3)	Formaldehyde (µg/m^3)
Lab	12/23/11	9	32	0.40	5.9	42
JPM	12/23/11	10	35	0.39	6.2	--
SM	12/23/11	9	33	0.36	5.8	35
COL	01/09/12	10	11	0.76	6.6	--
Lab	01/09/12	11	35	0.50	7.2	55
SM	01/09/12	--	--	--	--	41
Lab	02/01/12	8	36	0.78	5.0	50
JPM	02/01/12	9	23	0.74	5.7	--
SM	02/01/12	--	--	--	--	37
Lab	02/27/12	7	16	0.66	4.6	34
COL	02/27/12	8	17	0.50	5.0	--
SM	02/27/12	9	20	1.02	5.9	38
ATV3 (first entry)	03/29/12	28	2	2.64 (0.94)	5.9	--
Lab	04/03/12	8	15	0.68	4.6	37
JPM	04/03/12	9	18	0.75	5.0	--
SM	04/03/12	8	28	0.72	4.8	27
SM	04/24/12	8	31	0.43	5.1	--
Lab	04/24/12	8	30	0.50	4.6	--
Lab	05/29/12	16	31	0.42	6.8	33
SM	05/29/12	--	--	--	--	32
Guideline		*<25*	*none*	*<1.0*	*<5*	*<120*

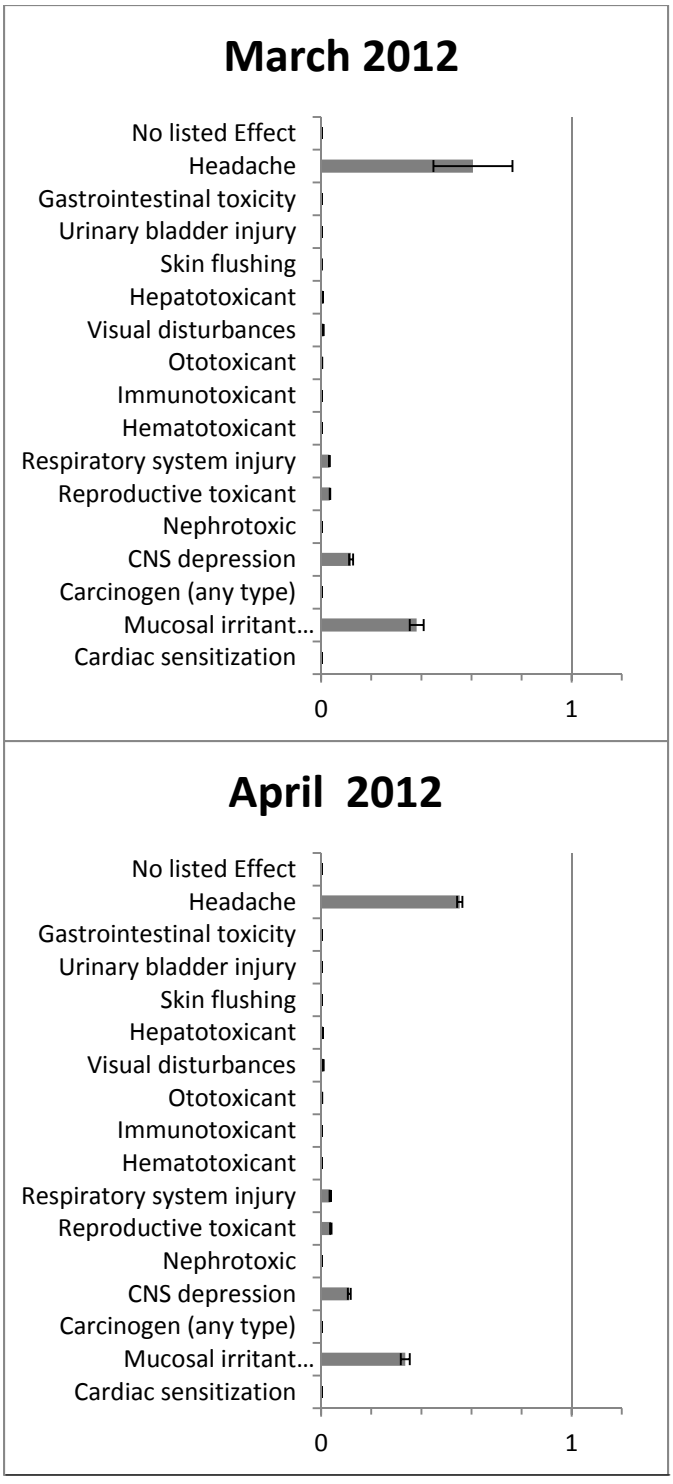
[a] Non-methane volatile organic hydrocarbons, excluding Freon 218

[b] Based on 180-d SMACs and calculated excluding CO_2 and formaldehyde. Parentheses indicate 7-day SMAC comparison.

General Observations about ISS Air Quality: This is a very limited set of samples on which to perform an air quality assessment. However, based on these samples, we have no reason to believe that nominal ISS air is unsafe to breathe. Formaldehyde values were up some in January and early February, but were decreased to ~30 µg/m^3 by late February. The relatively high T value at ATV3 first entry was due to the presence of hexamethylcyclotrisiloxane, trimethylsilanol, and fluorotrimethylsilane, all compounds that are reasonably well removed by the air revitalization systems.

Air Quality Monitor DTO: The figures below summarize the potential for any health effects based on data from the Air Quality Monitor (AQM) DTO, CO_2 monitors, and formaldehyde badges. Each panel is an average of weekly panels created during the designated month with the SD of those values shown as limit bars. By remaining consistently below T=1, these data show that the air quality is nominal and stable.





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Enclosures Table 1: Analytical concentrations of compounds found in the Soyuz 28&29 GSCs
Table 2: T-values of the compounds in table 1